

# Chemical Weapons Improved Response Program 2000 Summary Report



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## **Program Director's Message**

Subject: 2000 Chemical Weapons Improved Response Program Summary Report

The purpose of this summary report is to inform members of the first responder and emergency management communities about the on-going activities, initiatives, and lessons learned from the Chemical Weapons Improved Response Program (CWIRP). It is the intent of this program to relay information to these communities that will result in improved procedures, organizations, individual personnel knowledge base, and awareness of equipment capabilities surrounding a terrorist use of chemical agents. The information and experience shared among members of the national response community will hopefully be used as a tool to better prepare our nation as a whole against the inevitability of the use of chemical agents of mass destruction on U.S. soil.

The CWIRP Summary Reports are available via the SBCCOM website,  
<http://www2.sbccom.army.mil/hld>.

James K. Warrington  
Program Director  
Domestic Preparedness Program

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# Part I

## Introduction

### **Domestic** *Preparedness*

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The Domestic Preparedness Program (DPP) is a congressionally mandated program developed to support legislation passed under Title XIV “Defense Against Weapons of Mass Destruction” of the 1997 National Defense Authorization Act. The Department of Defense (DoD) was appointed as the executive agent for coordination of assistance from Federal agencies through the States to enhance first responder preparedness. One of the initiatives under this legislation is the establishment of a program to improve the civilian response capability to chemical and biological (C/B) terrorism. The Improved Response Program (IRP) was developed to identify and improve systemic deficiencies in the ability of a community to effectively respond to a C/B terrorist incident. Because there are major differences between the C/B agents and the expected response, a separate program was developed to study each area.

The city of Baltimore, MD volunteered to be the test-bed location for the efforts of the Chemical Weapons Improved Response Program (CWIRP). The CWIRP developed a series of exercises, entitled Baltimore Exercise (BALTEX), to present information regarding the potential for terrorist use of chemical warfare agents and, with functional working groups identify issues revolving around their response to a chemical event. The four functional working groups, Emergency Response, Law Enforcement, Health and Safety, and Emergency Management formed committees to develop solutions and recommendations for improving the civilian response capability.

The Domestic Preparedness 1997-1998 Summary Report outlines major activities and accomplishments of the first 18 months of the CWIRP. The report provides a brief synopsis of the program focus during this period. It synthesizes the series of exercises that were conducted to assist participants with identifying key operational and procedural issues within functional areas of responsibility as they pertain to crisis and consequence management of a chemical weapon of mass destruction (WMD) event. The Report also identifies several technical studies initiated to provide an analytical basis for the development of recommendations for improved response.

The Chemical Weapons Improved Response Program 1999 Summary Report outlines the major activities of the second year of the program. This includes a series of exercises focusing on issue resolution along functional lines of responsibility. Previously initiated technical studies were completed and final reports delivered. Additionally, new studies were identified and started to further enhance the Program’s recommendations.

The 2000 Summary Report addresses activities in the final mandated year of the program. The CWIRP conducted several tabletop exercises and one functional exercise to demonstrate the efficacy of operational concepts and procedural guidelines developed within the functional groups. One of the most significant highlights of the year came when the Department of Justice requested CWIRP advisory support for the largest, domestic terrorism exercise ever attempted, Top Officials (TOPOFF) 2000. Meanwhile, program participants continued to identify key issues requiring in-depth discussion and answers. As a result, several additional efforts were initiated and addressed in a series of workshops.

The status of the technical studies briefed in the 1999 Summary Report is outlined in Part IV of this report. These reports provide a comprehensive outline of recommendations for responding to

a chemical WMD event. These reports may be found on the SBCCOM Web site: <http://www2.sbccom.army.mil/hld> as they are completed and approved for public release.

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## Part II

### Major Activities Summary



## A. Baltimore Exercise (BALTEX) X

**Date:** March 16, 2000

**Location:** Holiday Inn, Baltimore-West, Baltimore, MD

**1. Introduction.** BALTEX X was a time-phased tabletop exercise designed to introduce members of the law enforcement community to the recommendations of the CWIRP Law Enforcement Functional Group. It focused on the issues facing law enforcement officers responding to a no-notice act of chemical terrorism at the Baltimore Convention Center.

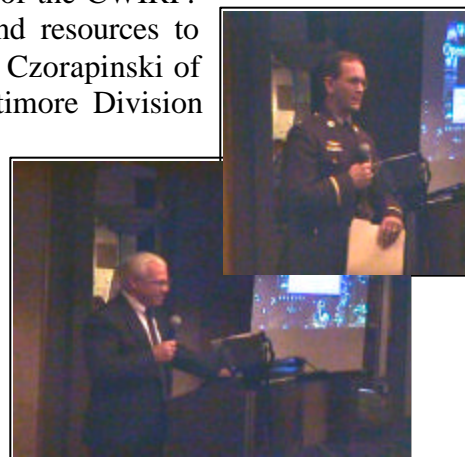


**2. Background.** The objective of BALTEX X was to validate the recommendations of the Law Enforcement Functional Group. Over the past 18 months the Group developed operational guidelines for a law enforcement response to chemical terrorism to include recommended roles and levels of protection required to perform specific missions. The CWIRP conducted several studies that addressed personal protective equipment issues. This information is the basis upon which issues were developed and presented to the participants during the exercise.

The CWIRP hosted BALTEX X in conjunction with the Maryland State Police (MSP). The MSP have unselfishly supported the law enforcement efforts of the CWIRP. This support includes providing the necessary manpower and resources to perform the PPE ensemble testing. Lieutenant Colonel David Czorapinski of the MSP and Special Agent Anthony Betz of the FBI-Baltimore Division provided opening remarks prior to the exercise.

Participants included representatives from 17 law enforcement jurisdictions throughout the Baltimore metropolitan area, Washington, DC, and New York City. Participants were organized into discussion groups based on their functional specialty and arranged in accordance with specific areas upon which the Law Enforcement Functional Group focused their attention. Discussion groups were organized from the exercise participants as follows:

- Command
- Patrol
- Dispatch/Communications
- Intelligence/Investigation
- Tactical (SWAT)
- Bomb Squad/EOD
- Aviation
- Public Information Office



A lead facilitator conducted a situation briefing while supporting facilitators from the Law Enforcement Functional Group were assigned to each one of the participant tables. BALTEX X was divided into seven modules presenting various levels of the community response during the first day of response to an unannounced release of Sarin nerve agent during an exhibit at the Baltimore Convention Center. Throughout the scenario presentation specific functional areas were highlighted based on the expected incident response procedures. Facilitators from the Law Enforcement Functional Group engaged participants in discussion of the program recommendations as they pertained to the current scenario presentation. After discussing the each module, the tables provided a back brief to all participants during a moderated discussion period.



With minimal exceptions, the overall consensus of the exercise participants was that the CWIRP recommendations documented in the draft law enforcement reports are valid.

## B. CWIRP Support to TOPOFF 2000

**Date:** May 20-22, 2000

**Location:** Portsmouth, NH

**1. Introduction.** In response to Senate Report 105-235, the Department of Justice (DOJ) and the Federal Emergency Management Agency (FEMA) co-sponsored a no-notice multi-component, multi-site exercise known as TOPOFF (Top Officials Exercise). TOPOFF focused on separate, simultaneous, terrorist events occurring at three locations across the country during a 10-day period. Venues and scenarios for TOPOFF included no-notice attacks involving a biological agent in Denver, CO, a chemical agent in Portsmouth, NH, and a radiological incident in the National Capitol Region.



**2. Background.** In order to meet the requirements for conducting a Federal, State, and Local (FSL) exercise under legislation enacted in 1997, the Department of Defense (DoD) entered into an agreement with DOJ and FEMA to meet their FSL objectives in conjunction with TOPOFF. The FSL centered on the 3-day exercise involving the integration of local, state, and federal assets in response to a simulated act of chemical terrorism in Portsmouth, NH. The FSL exercise component was a full-scale chemical response exercise conducted over a 54-hour period.



The CWIRP provided subject matter experts in the areas of emergency management, emergency response (fire, EMS, and Hazmat), law enforcement, and medical care. The CWIRP responded with a complement of functional experts that have been responsible for conducting program workshops and developing the recommended procedures outlined in the CWIRP reports.

The CWIRP's involvement also encompassed complete video documentation and a written observation report that addressed the local response and the integration of supporting state and federal resources. Program participants partnered with six professional film crews and provided 24-hour coverage of the exercise. In addition to directing the efforts of the film crews and providing commentary on the exercise response, the CWIRP performed editing of the video footage. Participants assisted video production teams in identifying critical response areas and decision points in the exercise. Together, they were tasked with turning the raw video footage into a series of video presentations that captured the essence of each functional area. These documented areas included:





- Law Enforcement
- Fire
- Hazmat
- Medical (EMS, hospital)
- Emergency Management

Upon completion of the exercise, selected CWIRP team members participated in a formal exercise briefing to members of the Northeast Consortium, which consisted of emergency management and response officials from local and state agencies in the Northeastern part of the United States. The CWIRP functional area video segments acted as the framework around which the briefing centered. Representatives of the CWIRP exercise team participated as members of the panel of experts that addressed key issues for the collective audience.





## C. Dover, DE CWIRP Workshop

**Date:** July 11, 2000

**Location:** Dover, DE

**1. Introduction.** The CWIRP conducted a one-day workshop involving the local responders and emergency managers/disaster planners from the Dover area, including Dover Air Force Base. This workshop was held at the Dover Fire Academy in Dover, DE. The goal of this workshop was to introduce the local area responders and emergency managers to the CWIRP recommended response strategies and technical studies.

**2. Background.** Members of the CWIRP team conducted presentations to increase awareness of the participants to the potential for and consequences of terrorist use of chemical agents. Subject matter included in this overview were basic threat awareness, employment techniques, and chemical agent awareness information. Team members presented information regarding the background of the CWIRP. Attendees were provided copies of the emergency response technical reports and were apprised of the additional ongoing studies and functional group activities within the program. Detailed presentations focused on the guidelines outlined in these reports and discussed their applicability to the local community.



In addition to the formal program presentations, participants viewed the draft emergency response video that is being produced as an introduction to the emergency response technical reports. This was the first public viewing of the video product outside of the CWIRP. This review provided the opportunity to gain first hand insight into the applicability and effectiveness of the videos while the product was still in its production phase. Participants provided very positive and constructive feedback on the content and design of the video indicating that it clearly presented the issues important to the fire community.

Following the program presentations, Program members conducted a facilitated tabletop that focused on a chemical terrorist incident using Sarin nerve agent at a local political gathering. The tabletop offered local responders a realistic scenario within which to evaluate program recommendations and make decisions on their adaptability with their current response procedures. Additionally, the exercise provided the forum to discuss the capabilities that exist at Dover Air Force Base that could support the local community faced with a major chemical response scenario.



## D. Baltimore Exercise (BALTEX) XI

**Date:** August 23, 2000

**Location:** Poly/Western Complex, Baltimore, MD

**1. Introduction.** BALTEX XI was a 3-hour functional interagency exercise designed to validate the Off-Site Triage, Treatment, and Transportation Center (OST<sup>3</sup>C) concept for providing an alternative medical care facility to assist the current healthcare infrastructure respond to a chemical WMD incident. The exercise focused on the City of Baltimore's adaptation of the generic OST<sup>3</sup>C concept. It focused on the participants' ability to provide medical evaluation, transportation, and/or services to triaged minimal casualties transported from the scene and self-referring casualties seeking medical intervention.



**2. Background.** BALTEX XI was based on a plausible scenario presenting a combination of casualties and “worried-well” that challenged the existing medical community's ability to provide immediate casualty care. In response to the situation, community leaders determined it necessary to establish and operate an OST<sup>3</sup>C. This scenario involved the release of a chemical agent (Sarin) at a Johns Hopkins University auditorium where over 800 professionals were attending a conference with an additional 200 people protesting outside the hall.

BALTEX XI evaluated the overall operation, staffing and patient flow of the OST<sup>3</sup>C starting from the time the Center was prepared to receive patients, through the processing of 200-300 casualties. The exercise was not designed to evaluate the emergency system's decision to initiate an OST<sup>3</sup>C, nor was it designed to evaluate the length of time required to stand-up the facility.

BALTEX XI was a free-playing training exercise, utilizing a limited Master Scenario Events List. Participants' actions were governed by their agency's standard operating procedures (SOPs), Domestic Preparedness Program training, and Incident Command direction and control guidelines. Objectives for the exercise were as follows:

- Validate the Baltimore City Health Department OST<sup>3</sup>C plan to supplement the existing healthcare system in response to a chemical WMD incident.
- Familiarize appropriate agencies with the OST<sup>3</sup>C concept to provide care for patients triaged minor at the scene, the worried well who have no physical injury, and those citizens who self-refer to the alternate care facility (ACF).
- Provide decontamination, medical evaluation, transportation, and/or services to the triaged minimal casualties from the scene, self-referring population and the special needs population.

- Provide on-site decontamination (gross and detailed).
- Gain a realistic perspective of processing time for patient services at the OST<sup>3</sup>C.

Over 200 players, staff, and observers participated in the exercise from the following agencies: Baltimore City Health Department, Baltimore Office of Emergency Management, Baltimore City Fire Department/Emergency Medical Services, Baltimore City Police Department and School Police, Baltimore Mental Health Systems Inc., American Red Cross, Baltimore City Department of Public Works, Yellow Transportation, and Baltimore City Health Department Animal Control.

The exercise addressed patient processing requirements and challenges from arrival through discharge. Stations throughout the Center included Initial Triage; Gross Decontamination and Detailed Decontamination; Registration and Secondary Triage; Treatment; Exit Interview and Recovery (Cafeteria). Additional stations available to patients included a Law Enforcement Investigation Desk and a Help Desk.



BALTEX XI participants, controllers, and evaluators had the opportunity to analyze and critique the exercise at the conclusion of the exercise and at an after action review. Lessons learned from BALTEX XI will be written in the formal After Action Report and will be incorporated into the final OST<sup>3</sup>C concept. The final OST<sup>3</sup>C concept will be available on the SBCCOM Web site: <http://www2.sbccom.army.mil/hld>.

## E. CRIME 2000

**Date: September 20, 2000**

**Location: Hazleton, PA**

**1. Introduction.** CRIME 2000 was designed to present the Law Enforcement Functional Group recommendations to an audience of participants that were unfamiliar with the CWIRP and who, for the most part, had not received the Domestic Preparedness WMD training. CRIME 2000 was a time-phased tabletop exercise conducted with the support of the Pennsylvania State Police (PSP).



**2. Background.** The objective of CRIME 2000 was to validate the recommendations of the CWIRP Law Enforcement Functional Group as they pertained to the local and state police agencies in support of a jurisdiction outside of a large metropolitan region. Participating organizations were selected in conjunction with the Pennsylvania State Police and included numerous local township/borough, city, and county departments. Many of the State Police Troops from throughout the state participated as well as several specialty and staff positions. Representatives from four of the regional Pennsylvania FBI offices also participated.

Members of the Law Enforcement Functional Group and selected representatives from PSP facilitated group discussions of the scenario. They also presented the recommendations from the CWIRP Law Enforcement Functional Group in response to the scenario as it was presented. The program conducted an awareness session with the PSP facilitators prior to the exercise to discuss the program's recommendations.



For the most part, participants in this region of Pennsylvania are not trained and equipped to operate in chemical protective equipment and have not had formal WMD training. As such, a large part of the discussions focused around protective equipment and response actions. Participants were provided an exercise read-ahead packet that outlined the purpose of the exercise and an explanation of the key issues that was the basis for the law enforcement group's recommendations. In addition to the pre-exercise materials, participants were provided with copies of the published emergency response reports that are listed in Part III of this report.

CRIME 2000 was divided into six modules presenting various levels of response from the initial report of the incident through long-term site security and investigation. The scenario focused on an unannounced release of Sarin nerve agent during a concert at the First Union Arena in Wilkes-Barre, PA.

A lead facilitator conducted a situation briefing while group facilitators were assigned to each of the six participant functional tables to facilitate table discussions and present CWIRP recommendations. Functional tables were organized as follows:

- Command
- Patrol
- Dispatch/Communications
- Intelligence/Investigation
- Tactical (SERT and Bomb)
- Aviation/Public Information.

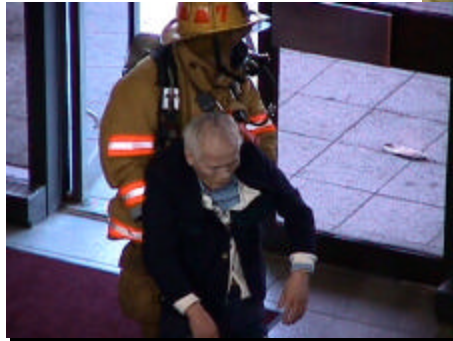


The recommendations of the CWIRP were emphasized throughout the scenario presentation and during functional group discussions. Following each module and table discussion, the lead facilitator moderated a back brief of key functional areas.



## Part III

### CWIRP Products



## A. Emergency Response Technical Reports

### 1. *Guidelines for Incident Commander's Use of Firefighter Protective Ensemble (FFPE) with Self-Contained Breathing Apparatus (SCBA) for Rescue Operations During a Terrorist Chemical Agent Incident*

**Study Overview.** The primary objective of this study was the firefighter protective clothing assessment (bunker gear testing) to evaluate the degree of protection afforded by standard firefighter protective gear against chemical warfare agents (CWAs) during quick rescue operations. Man-In-Simulant Test (MIST) vapor tests were used to measure the actual absorption of agent simulant (Methyl salicylate [MeS], basically wintergreen oil) into human skin by using passive samplers located on 17 regions of the body. Testing was conducted using new Polybenzimidazole (PBI), used PBI, new Nomex®, and used Nomex®, all with SCBA for eye and respiratory protection. The result of extensive analysis of data from the MIST identified firefighter protection times while exposed to chemical agent vapor during quick rescues of live victims.



Guidelines from the study indicate that

- Standard turnout gear with SCBA provides a first responder with sufficient protection from nerve agent vapor hazards inside interior or downwind areas of the hot zone to allow 30 minutes rescue time for known live victims.
- Self-taped turnout gear with SCBA provides sufficient protection in an unknown nerve agent environment for a 3-minute reconnaissance to search for living victims (or a 2-minute reconnaissance if HD is suspected).

The guidelines are compiled in a report, *Guidelines for Incident Commander's Use of Firefighter Protective Ensemble (FFPE) with Self-Contained Breathing Apparatus (SCBA) for Rescue Operations During a Terrorist Chemical Agent Incident*, published in August 1999. Jurisdictions should obtain a complete copy of the report to fully understand the recommended guidelines and associated risks before performing such rescue operations. The final report can be obtained online at the SBCCOM Web site: <http://www2.sbccom.army.mil/hld>.

### 2. *Use of Positive Pressure Ventilation (PPV) Fans To Reduce the Hazards of Entering Chemically Contaminated Buildings*

**Study Overview.** This report contains information on the results of testing of Positive Pressure Ventilation (PPV) fans for use by emergency responders in the event that CWAs are employed in a terrorist incident. SBCCOM tested PPV fans, commonly used equipment among many fire departments, to determine the level of reduction of agent in a building prior to fire and rescue personnel entering. PPV fans supplemented the rescue personnel's use of SCBA and bunker gear. Test engineers used MIST testing techniques to determine the physiological

protective dosage factor of various sizes and configurations of the most commonly used PPV fans, combination of multiple fans and use of fans in the Negative Pressure Ventilation (NPV) mode. Results of the study outline the advantages of PPV fans in reducing agent concentration and in increasing the protective factor (PF) of the firefighter turnout gear and SCBA.



Basic guidelines from the PPV study indicate that

- The use of PPV fans dramatically decreased the interior chemical agent vapor concentration of structures. For example, PPV fans can reduce the vapor concentration by 50 – 70 percent during the first 10 minutes of use.
- PPV significantly increased the first responders' protection above and beyond the adequate protection provided by standard turnout gear with SCBA when rescuing known live victims.
- Before using PPV, consider the downwind hazard for unprotected people.
- Bigger fans are better. Two fans are better than one. Tilting the fan improves performance.
- Use Negative Pressure Ventilation at buildings where victims are present in closed interior rooms (doors closed).

The report, *Use of Positive Pressure Ventilation (PPV) Fans to Reduce the Hazards of Entering Chemically Contaminated Buildings*, was published in October 1999. It can be obtained online at the SBCCOM Web site: <http://www2.sbccom.army.mil/hld>.

### **3. Guidelines for Mass Casualty Decontamination During a Terrorist Chemical Agent Incident**

**Study Overview.** The purpose of the mass casualty decontamination study was to identify and propose solutions to the challenge of effectively and efficiently decontaminating victims, both responder and civilian, of a chemical event. Emphasis was placed on decontamination methods that could be performed with equipment and expertise readily available to most responder jurisdictions. The efforts of the Mass Casualty Decontamination Research Team during this study resulted in the establishment of several general guidelines for the development of mass casualty decontamination policies and procedures.



The basic principles of decontamination derived from the mass casualty decontamination study are

- Expect a 5:1 ratio of unaffected to affected casualties.
- Decontaminate as soon as possible.
- Disrobing is decontamination; Top to Bottom, the More the Better.



- Water flushing generally is the best mass decontamination method.
- After known exposure to liquid agent, first responders must self-decontaminate as soon as possible to avoid serious effects.

The guidelines are cited in the report, *Guidelines for Mass Casualty Decontamination During a Terrorist Chemical Agent Incident*, and were published in January 2000. The final report can be obtained online at the SBCCOM Web site: <http://www2.sbccom.army.mil/hld>.

#### **4. Chemical Protective Clothing for Law Enforcement Patrol Officers and Emergency Medical Services when Responding to Terrorism with Chemical Weapons**

**Study Overview.** The purpose of the law enforcement and EMS protective clothing study was to evaluate commercially available protective suits that may be worn by police officers and EMS providers during response to a terrorist chemical attack involving chemical warfare agents. The study focused on the levels of protection necessary for responders operating in the Cold Zone or on the boundary of the Cold and Warm Zones. Members of the Maryland State Police (MSP) assisted in the study by providing test subjects who conducted standard law enforcement activities that might be performed on the incident scene. The study tested four chemical protective ensembles, a mechanic's asbestos overalls and the standard MSP duty uniform. Testing was conducted in the SBCCOM MIST test facility.



Basic information gained from the study included

- The primary protection that officers and/or first responders should use in these situations is high quality respiratory protection.
- Law enforcement and EMS personnel can be equipped with an effective low-cost clothing ensemble.
- The standard duty uniform and mechanic's overalls provide insufficient protection against chemical vapor adsorption by the skin.
- An ensemble consisting of a high quality respirator, butyl rubber gloves and a commercial chemical overgarment provide excellent protection for personnel working in the Cold Zone or on the perimeter of the Cold and Warm Zones.
- This clothing ensemble is not adequate for use in areas where significant levels of CWA vapor concentration may be present (Hot Zone, immediate area of a CWA weapon or release).
- The chemical protective suits tested also provide limited protection against liquid chemical agents
- The predominant area affected by the agent simulant was the chin and neck region. Although each suit evaluated included a hood there were varying amounts of exposed



neck area. This problem can be eliminated with the inclusion of a standard respirator hood.

The results of the study were published in November 1999 as the *Chemical Protective Clothing for Law Enforcement Patrol Officers and Emergency Medical Services when Responding to Terrorism with Chemical Weapons* report. This report can be obtained online at the SBCCOM Web site: <http://www2.sbccom.army.mil/hld>.

## B. Chemical Weapons Improved Response Program (CWIRP) Playbook

**1. Playbook Objective.** The Playbook is one of several products of the CWIRP and serves as a cornerstone document designed to identify the key issues that the program studied and provides basic recommendations and guidelines for enhancing response and management of a chemical incident. This document, along with the Program's technical studies and written concepts, provides a comprehensive collection of knowledge from the CWIRP. The issues covered in the Playbook are intended to be applicable to the majority of jurisdictions across the country (i.e., large, small, metropolitan, rural) and address functional area shortfalls not requiring a detailed technical report.

**2. Playbook Overview.** The CWIRP partnered with federal, state, and local emergency response as well as medical and emergency management agencies in the Baltimore metropolitan region to identify and resolve issues involving response to chemical terrorist events. The partners in the CWIRP process formed four functional groups to address the concerns of responding to a chemical incident. These functional groups consist of federal, state, and local experts in the areas of:



- Emergency Response
- Law Enforcement
- Health and Safety
- Emergency Management



The CWIRP conducted a series of exercises called Baltimore Exercise (BALTEX) that consisted of tabletop, functional, and workshop formats to assist members of the functional groups in recognizing the magnitude surrounding a chemical incident and to identify the key issues that needed resolution. Each functional group, through regularly scheduled meetings and workshops as well as the BALTEX exercises, focused on identifying recommended procedural guidelines to address each issue. These guidelines are the heart of the Playbook.

The CWIRP Playbook is divided into sections that focus on the sequential response to a chemical incident. These sections are separated into the following areas:

- Pre-Incident Plans and Procedures
- Initial Response – The First Hour
- Follow-On Response – The First Day
- Long Term Response and Recovery

Each section identifies the functional group issues and recommendations as they pertain to that stage of the response. The subject matter experts from each functional area supporting the

CWIRP developed the list of issues. However, each jurisdiction has its own policies and ways of conducting business. Users of the Playbook should feel free to adapt the subject matter it contains based on their own experience, training, equipment, and expertise.

**3. Conclusions.** The Playbook is in the final stages of development and is intended to be a living document, i.e., it will be updated as new recommendations are made and others are further refined. It is anticipated that the Playbook will be completed and approved for public release by the spring of 2001. At that time it will be posted on the SBCCOM Web site: <http://www2.sbccom.army.mil/hld>.

## C. Guidelines For Responding To A Chemical Weapons Incident (Quick Response Guide [QRG])

**1. Guide Objective.** Members of the Chemical Weapons Improved Response Program's (CWIRP) Law Enforcement, Health and Safety, and Emergency Response Functional Groups developed these guidelines with the intent to give assistance to all response personnel in dealing with critical incident management decisions consistent with a chemical weapons emergency response.



**2. Guide Overview.** The Guidelines for Responding to a Chemical Weapons Incident, commonly referred to as the Quick Response Guide (QRG), supplements the Playbook and technical studies by providing responders with an easy reference guide to key decisions that must be made when responding to a chemical terrorist event. It is designed as a quick reference tool that is readily available to each supervisor on the scene of a chemical incident.

The Guidelines are divided into sections that focus on the sequence of responding to a chemical incident. These sections are separated into the following areas:

- |                             |                           |
|-----------------------------|---------------------------|
| • 911 Operators             | • Hospital Notification   |
| • Dispatch Notification     | • OST <sup>3</sup> C      |
| • Actions On Arrival        | • Fatality Management     |
| • Fire Department           | • Law Enforcement         |
| • Incident Command          | • Law Enforcement Roles   |
| • Sector Assignments        | • Patrol                  |
| • Casualty Rescue           | • Bomb Squad              |
| • Decontamination           | • Intelligence            |
| • Technical Decontamination | • Investigation           |
| • Hazmat Team               | • Emergency Management    |
| • EMS                       | • On Scene Communications |
| • Patient Segregation       | • Media                   |

Each section identifies planning considerations and decisions facing responders relevant to selected stages of the response. The guidelines provide an informative list of actions to assist responders in managing a chemical incident response. Users of the document should feel free to adapt the subject matter it contains based on their own experience and expertise.



**3. Conclusions.** The QRG is based on the procedures and recommendations developed through the series of workshops, exercises, and technical studies that have been published by the CWIRP. This guide will be published as an annex to the Playbook and also as a separate pocket guide. The QRG will be posted to the SBCCOM Web site: <http://www2.sbccom.army.mil/hld> when it is completed.

## D. Law Enforcement Personal Protective Equipment Report

**1. Study Objectives.** The primary objective of the law enforcement personal protective equipment (PPE) assessment is to examine the roles of and risks to law enforcement personnel responding to an act of terrorism involving chemical warfare agents. Furthermore, it makes protective equipment recommendations that are supported by scientific evaluation for improved response by law enforcement.



**2. Study Overview.** Through the CWIRP series of exercises and discussions, the Law Enforcement Functional Group identified multiple roles for law enforcement that are specific to responding to a chemical terrorist incident. The Group conducted a series of workshops to define these roles and to focus on equipment and training to develop guidelines that enable departments to perform these roles safely and effectively. The general guidelines and recommendations of the group are outlined in the CWIRP Playbook. In order to provide definitive recommendations on officer safety and PPE levels, the Group recommended that several technical studies be conducted. The results of these studies, which focused on general respiratory protection guidelines and protective suit ensembles for patrol and tactical operations, will be published in a comprehensive Law Enforcement PPE Report.

The studies addressed respiratory protection in four phases. These consisted of

- Informal evaluation of the types of respirators (escape, negative-pressure, powered air purifying, and self-contained breathing apparatus) based on the level of protection anticipated, adaptability to mission requirements, training & maintenance required, and user evaluation.
- Evaluation of the respiratory protection currently in use by many departments for riot control purposes.
- Identification of current respiratory safety regulation requirements and their impact on departments.

Quantitative measurement of the protection afforded by respirators determined to fit mission requirements in relation to the protection afforded by recommended suit ensembles.

The patrol officer PPE study focused on protection for officers performing duties involving limited threat of exposure to agents. These include perimeter security, evacuation assistance, crowd control etc., where the danger from agents is primarily due to vapor exposure from wind shifts and cross-contamination from exposed citizens.



PPE ensembles for testing were chosen based on the threat of contamination, mission requirements, and costs to the departments. The Group's intent was to develop alternatives at a cost below \$150 per officer.



Scientists and engineers conducted the tests using a negative-pressure (gasmask) respirator, butyl rubber boots and gloves, and various types of disposable chemical protective overgarments. Testing was conducted in the Man-In-Simulant Test (MIST) chamber with chemical agent simulants following the protocols accepted for testing military chemical/biological protective clothing. This method of testing was also used in determining the protective qualities of firefighter turnout gear against chemical warfare agents in 1998. Volunteers from the Maryland State Police performed a series of tasks inside the chamber, simulating actions they would expect to perform at an incident scene, for example, traffic control, handcuffing, running/walking, and use of communications equipment. Testers determined the protective factors for each suit based on the accepted test protocols.

In addition to patrol duties the Law Enforcement Functional Group identified several roles requiring a law enforcement presence in areas suspected of containing an increased level of agent concentration. Included in these areas are suspect apprehension in a contaminated area (decontamination corridor for example) and conducting a raid/hostage rescue at location where a suspect is producing/storing chemical agents.

These missions lend themselves to specially trained units, such as SWAT. Ensembles tested for patrol duties were not compatible with tactical operations, therefore testing was conducted using military and commercial style charcoal impregnated suits. Evaluation of these suits focused not only on the protective qualities against the agent simulant but also on their suitability to the team's equipment and tactics.



Tactical officers from the Maryland State Police Special Tactical Assault Team Element (STATE) conducted stealth and dynamic tactical operations in a vapor simulant environment wearing negative-pressure respirators, butyl rubber gloves, and a variety of suits.

**3. Conclusions.** Performing duties in a contaminated environment and in compliance with safety regulations associated therewith are new challenges for law enforcement. Departments' current levels of training and equipment inventory are based on riot control gear and situations. While departments are very comfortable with this equipment, findings from the evaluations indicate that respiratory equipment currently in use (specifically M17 style masks) is antiquated and in some instances unserviceable for use in a chemically contaminated environment.

Patrol officer ensembles tested provided 17 – 42 times the protection afforded by their normal duty uniform. These protection factors are sufficient for the specified missions based on the limited threat of contamination. The suits tested consisted of a hood for protection of the head, however, the principle drawback to the suits was that they all presented a clearly unprotected opening around the neck area below the chin. Using a hood attached to the mask can alleviate this issue.

Testing of PPE for tactical operations is not yet completed. Preliminary indications are that the suits are very well suited to the tactical officers and their equipment. Protective qualities of the suits exceed those that have been established for negative-pressure respirators. Therefore,

the respirator is the limiting factor on conducting tactical missions in areas of increased agent concentration.

The final law enforcement PPE report is scheduled to be completed and approved for public release by the Spring of 2001, at that time it will be posted on the SBCCOM Web site: <http://www2.sbccom.army.mil/hld>.



## E. Emergency Response Video Series

**1. Project Objective.** The CWIRP has produced a training oriented video series that is designed to increase the awareness and overall preparedness of the nation's emergency response and management communities to a chemical terrorist event.

**2. Project Overview.** The CWIRP emergency response video series will be released in the fall of 2000 for national distribution. The four part series begins with an overview of the CWIRP, while the other three are designed to capture the key findings from ongoing technical initiatives that have been a cornerstone of the Program over the past two years.



This Program project was developed under the auspices of the Emergency Management Functional Group working in close coordination with the Emergency Responder Functional Group. Upon completion of several technical initiatives sponsored by the Program, the Groups believed that it was important to get the word out to their respective communities and to educate those communities about the generation and purpose of the CWIRP. Therefore, the series begins by describing the organization, partnerships, and goals of the Program. It also sets the stage by dramatizing a realistic scenario that shows the employment, consequences, and response challenges facing those who must deal with these situations.

The videos' primary purpose is to address findings from the mass decontamination, positive pressure ventilation, and firefighter personal protective equipment (e.g., bunker gear, self-contained breathing apparatuses) technical initiatives. These studies were designed to closely examine standard emergency response operational parameters in a simulated chemical environment using established scientific, analytical test and evaluation procedures. Most importantly, the studies make recommendations for improved response under such circumstances. The final reports for each of these studies can be found on the SBCCOM Web site: <http://www2.sbccom.army.mil/hld>.



Once the videos are completed, the Emergency Response Functional Group determined that one of the best methods of getting the word out to the response community about these reports is via broadcast over national responder closed circuit training media and reproduced and exported across the nation down to the individual firehouse level. The format for the videos is such that they are a flexible training tool, i.e., they are short (average 5-8 minutes in length) and to the point. The information is presented in the context of a realistic scenario designed to capture and hold the attention of the viewing audience. The essential information that the responder needs to know has been condensed from the detailed and technical written reports that, as noted above and in the videos themselves, are available on the Internet.



The Emergency Management Functional Group has conducted review and critique sessions with test audiences (e.g., local fire stations, hazardous materials groups, emergency management personnel) and the initial feedback indicates that the videos hit the mark for being what the response community needs to heighten both their awareness and preparedness posture. Information on how to get copies of the videos will soon be available on the Internet at the SBCCOM web page.

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## Part IV

### Ongoing Technical Study Initiatives



## A. Alternative Medical Care Facility - The Off-Site Triage, Treatment, and Transportation Center (OST<sup>3</sup>C)

**1. Study Objectives.** The CWIRP Health and Safety Functional Group undertook this initiative to develop guidelines that can be used in multiple jurisdictions for establishing a temporary alternative medical facility to supplement the existing health care system by caring for non-critical patients from a chemical terrorist incident. The goal of the center is to provide care for those patients triaged minor at the scene, the worried-well who have no physical injury and those citizens who self-refer to the center.



**2. Study Overview.** The Group identified the following steps as necessary components for developing the guidelines, validating the operational parameters of an OST<sup>3</sup>C, and refining the concept so that it is applicable for use by multiple jurisdictions within the U.S.:

- Develop the concept based on principles from proven medical disaster approaches.
- Outline procedures in annexes describing how a jurisdiction might establish an OST<sup>3</sup>C.
- Perform a preliminary review of the concept with a panel of personnel and agencies that would likely establish and staff an OST<sup>3</sup>C.
- Conduct a functional exercise of the OST<sup>3</sup>C concept in order to evaluate the concept's operational strengths and shortfalls.
- Reformulate the OST<sup>3</sup>C concept of operation based on lessons learned from the functional exercise.
- Facilitate an external panel to review the concept and revise the document to obtain national level consensus.
- Publish the guidelines as a CWIRP report to assist a jurisdiction in developing their plans to manage mass casualty care from a chemical terrorist incident.

During 1999, the Health and Safety Functional Group developed the basic strategy for establishing an OST<sup>3</sup>C. In 2000, this concept was written with detailed annexes specifically addressing patient flow, station function, and staffing and resource requirements. An advisory panel consisting of personnel that would likely staff the Center conducted initial validation of this concept. This panel was comprised of members of the Health and Safety Functional Group, Baltimore City Health Department and local, state, and federal agencies that would be called on

to support the effort. Based on their critique, several enhancements were made to the original concept. These included:

- Incorporating an animal decontamination station.
- Expanding the role of mental health counselors to include “buddying” with mentally distraught patients.
- Identifying training needs for the staff that included weapons of mass destruction awareness (WMD) and medical management of chemically contaminated casualties.
- Establishing the Center’s scope of practice at an enhanced Basic Life Support (BLS) level.

This internal panel review helped establish some of the plan’s details. It presented the needs of those who would likely staff the Center and it confirmed that an agency, which was not accustomed to emergency response, could execute the concept. It further allowed an opportunity for each agency to review their role at the Center and determine their level of support to this initiative.

Representatives of the eleven city agencies, that would be responsible to support the Center, assisted the Health and Safety Functional Group during the planning of the functional exercise. Their participation provided a forum wherein they continued to evaluate and provide input into their roles and functions as part of the Center staff.

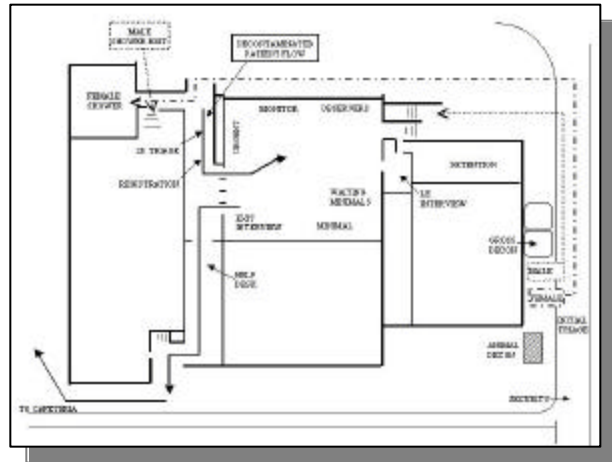
The CWIRP conducted the functional exercise on August 23, 2000, at the Baltimore Polytechnic Institute. This exercise, entitled BALTEX XI, applied the OST<sup>3</sup>C concept of operation to a high school for the purpose of evaluating the feasibility to operate an OST<sup>3</sup>C and to identify the plan’s strengths and shortfalls.

Exercise evaluators, controllers, and participants reviewed various aspects of patient flow, station function, division of labor, and command and control of the center. Immediate feedback was provided via an informal station hot wash conducted at the conclusion of the exercise. An in-depth controller and evaluator debriefing was conducted prior to release from the exercise to obtain both verbal and written evaluations. A formal hot wash was conducted one week after the exercise, whereby the eleven agency representatives addressed how their role at an OST<sup>3</sup>C could be improved. Based on input provided in each of these settings, the concept of operation was reformulated.

Lessons learned that influenced the revisions to the generic concept of operation included:

- Enhancing perimeter security, to include directing patients away from the center once they have exited.
- Changing the role of the American Red Cross from staffing the Help Desk to simply determining if they need to establish a mass care shelter at another location to support the citizens affected by the incident.
- Using mental health support in a more active role throughout the center as “buddies” for those patients who are mentally distraught and need help getting through the process.
- Relocating several stations in order to streamline patient flow through the center.

- Incorporating an Animal Decontamination Station.
- Enhancing the mission of the Data Collection Station (formerly Exit Interview Station) so that it functions more like a hospital discharge process.
- Suggesting that the OST<sup>3</sup>C be part of the larger response by recommending that the city establish a re-unification center for those patients who are unable to get home or do not know where to locate their family members.
- Voluntary quarantining of vehicles from self-referring patients due to contamination concerns.
- Disrobing patients using a plastic bag cover, before they enter the school, to simplify internal security measures.



**3. On Going Efforts.** Currently, the CWIRP is coordinating a national level review of the OST<sup>3</sup>C concept of operation. After the concept undergoes this final refinement, it will be published on the SBCCOM Web site: <http://www2.sbccom.army.mil/hld>.



## B. Mass Fatality Management (MFM)

**1. Study Objective.** Weapons of Mass Destruction (WMD) by design create a large number of fatalities. Well-employed chemical agents against a mass gathering can easily produce over 300 fatalities. Biological agents can easily produce fatalities rivaling the 1918 influenza pandemic. Most jurisdictions throughout the U.S. have little or no experience dealing with a large number of remains. Natural disasters such as hurricanes and tornadoes generally result in less than 100/50 deaths, respectively. There were 229 deaths in the TWA 800 airplane crash, while the bombing of the Murrah Federal Building in Oklahoma City resulted in 168 dead. The procedures for handling remains from a chemical WMD incident not only depend on the potential number of fatalities, but also on contamination concerns. To address these concerns the CWIRP developed a workgroup to ascertain the planning considerations for mass fatality management (MFM) issues associated with a chemical terrorist incident.

### CWIRP MFM Principles

- **Recovering remains from a chemical terrorist incident requires a coordinated effort between the medical examiner and law enforcement.**
- **Jurisdictions should make every effort to return remains to family members.**
- **Only under extreme circumstances should jurisdictions seek involuntary cremation.**

**2. Study Overview.** Through a workshop series, the CWIRP identified several issues pertaining to the handling of chemically contaminated remains. Departments that have experience in and procedures for decontaminating people, e.g., hazardous materials (Hazmat) teams, do not have the mission to decontaminate human remains. Secondly, local and state medical examiners' offices, which normally process remains, are not equipped to decontaminate remains nor perform operations in chemical protective suits and equipment.



In January 2000, the MFM working group convened to identify issues pertaining to the handling of remains and to recommend effective handling guidelines. The Group worked to ensure sound judgment, safety, operational feasibility, and overall consensus within the medical examiner, public health, and law enforcement communities on the report recommendations.

The Group includes representatives from all responsible and affected response agencies and personnel and technical disciplines with a broad scientific and operational knowledge base. The Group includes scientists and medical experts with expertise in chemical agent properties and dispersion characteristics, medical examiners who have direct knowledge of processing remains for criminal investigation, Hazmat specialists knowledgeable of chemical agents and decontamination procedures, and Disaster Mortuary Team (DMORT) members who have experience handling an extremely large number of fatalities. Working Group members were drawn from government and response organizations at all levels. Local and state participation was drawn from Maryland and the surrounding region. Federal participants include the Federal



Bureau of Investigation, Department of Justice's National Domestic Preparedness Office, and members of the Region III DMORT.

One of the first activities of the Group involved educating the membership to chemical WMD characteristics and the mission and capabilities of each participating agency. Issues were identified and discussed in relation to a series of scenarios. Members of the U.S. Army provided scientific and medical expertise on the toxicological considerations of agents. Technical procedures for handling remains and mass fatality management were provided by the local, state, and federal partners participating.



Through this process, the MFM Working Group developed operational guidelines to meet the unique requirements surrounding management of a large number of contaminated remains. The guidelines were then closely scrutinized for applicability to a variety of jurisdictions, personnel safety (for those who will work in direct contact), and operational effectiveness. Finally, the Group elected to synopsise and prioritize the key planning considerations for MFM to make it easier for communities to adopt into their own local plans. This portion of the effort is presently underway.

**The effort of the MFM working group focused on:**

- **Providing guidelines to manage a large number of chemically contaminated fatalities.**
- **Identifying a MFM process that would ensure the safety of technical personnel as well as the general public while still accomplishing the mission to gather evidence and return remains to the family.**



**3. Ongoing Effort.** Presently, the MFM Working Group has completed its first draft report identifying issues with corresponding recommendations. The Group is also working to provide additional insight into the interaction and mutual support requirements between a medical examiner's office (or local coroner's office) and the FBI in processing the crime scene and the remains.

Upon completion, the CWIRP will publish the report and it will be posted on the SBCCOM Web site: <http://www2.sbccom.army.mil/hld>.

## C. Tactical Team Protective Clothing Assessment

**1. Study Objectives.** The purpose of this initiative is to provide law enforcement with an assessment of the protection afforded to tactical teams when conducting tactical operations while wearing chemical protective ensembles. The study encompasses both a vapor and a liquid agent challenge to the protective ensembles tested. This effort was derived based on the expectation that a department's operational procedures and command decisions may result in tactical teams either choosing to perform operations in a known contaminated environment or in areas where the threat of exposure/agent release is likely.



**2. Study Overview.** With the assistance of the Maryland State Police Special Tactical Assault Team Element (STATE), the CWIRP is conducting Man-in-Simulant Tests (MIST) using several chemical protective ensembles that are compatible with tactical law enforcement operations. The tests are conducted at the U.S. Army SBCCOM test facility that has been specifically modified to contain a vapor concentration of methyl salicylate (oil of wintergreen - a food flavoring and principle ingredient in many topical skin preparations).

Initial testing is conducted to quantify protection provided by the ensembles in a simulated vapor hazard environment. Members of the MSP STATE, participating as test subjects, wear MIST samplers in several body regions while wearing chemical protective ensembles. During the test they perform mock raids, using both dynamic and stealth entry tactics at the warehouse test site. Moveable partitions are used to re-configure the interior, so that each test presents a new challenge to the participants. Test activities consist of a dynamic entry into the warehouse, which takes approximately three minutes. This part of the test is conducted first, so that test participants can practice securing an unknown configuration of rooms and corridors using dynamic entry processes. Following the dynamic entry period, stealth tactics are used to covertly secure the interior of the warehouse.



MIST provides an indication of the increase in skin protection provided by the ensembles. This information allows a quantitative assessment of the chemical hazards associated with using the ensemble in a vapor-contaminated environment. In addition to the chemical protection information obtained on each ensemble, these tests give the participants an opportunity to evaluate the compatibility of each ensemble with their tactical equipment and operations (tactics, weapons, communication etc.). The relative ease with which hand guns, shouldered weapons, communication devices, and other personal ballistics-protective equipment can be used with the chemical protective ensemble is assessed after each test by using a human factors questionnaire.

During MIST vapor testing, common contacts (hands, shoulders, knees) with walls, doorways, and the floor of the warehouse has been noted during stealth operations. When

making an entry into an area that is contaminated with chemical agent, recommended procedures are to avoid any liquid contamination. However, when liquid agent is widely distributed in the area, it will be very difficult to avoid. Limited visibility, resulting from respirator use, also causes test subjects to contact walls and doorways more than they normally would with full visibility. In these situations, small amounts of chemical agent might be contacted on surfaces by specific parts of the ensemble. In response to this, the CWIRP decided to add a liquid contact assessment as part of their SWAT clothing assessment. This assessment will help to determine the hazards presented by such contact, and to develop procedures for minimizing the hazards presented by liquid contact.



The liquid evaluations are performed by placing MIST samplers on the body, in regions where surface contact is made. Liquid drops, with a specific mass and a pre-determined density, are placed on non-absorbing surfaces, so as to maximize the amount of liquid available for pick-up by the contacting ensemble. Test subjects, wearing selected protective ensembles over the samplers then replicate the actions of the STATE team members when they contact the walls and floor of the test chamber. Dosages are then used to determine the hazards presented to persons who might contact liquid agent.

**3. Conclusions.** By combining the MIST test results with anticipated vapor challenges for tactical situations, the CWIRP will provide insight into the risk of tactical personnel exhibiting symptoms of chemical agent exposure resulting from performing operations in a chemical environment. Coordinating the MIST results with the Liquid Dissemination Distribution Assessment, discussed later in this summary report, will help law enforcement personnel assess how much liquid contamination must be avoided, how much contamination may be present following a liquid dissemination, and how rapidly they must proceed with decontamination if they contact liquid agent.

Knowing the risks associated with different protective ensembles, tactical teams will be able to select protective systems and chemical mission doctrines. This will ensure that chemical hazards remain manageable, during tactical law enforcement operations.

Results of the SWAT clothing assessment will be incorporated into the final law enforcement PPE report that is scheduled to be completed and approved for public release by the Spring of 2001. At that time it will be posted on the SBCCOM Web site: <http://www2.sbccom.army.mil/hld/>.

## D. Cold Weather Decontamination Study

**1. Study Objectives.** The purpose of the cold weather decontamination study is to identify suitable mass decontamination methods that can be performed under less than ideal weather conditions. This study also intends to produce guidance on temperature and other environmental impacts when standard water based decontamination processes are not recommended.

**2. Study Overview.** In 1998, the CWIRP formed a team to address the issues of performing decontamination on a large number of casualties following a chemical terrorist incident. This team, the Mass Casualty Decontamination Research Team, conducted workshops and studies that resulted in the development of the CWIRP Mass Casualty Decontamination Report. This group was reformed in 2000 to address specific technical and operational issues associated with decontamination of victims in cold temperatures. Additional team members for the cold weather study included representatives of civilian first responders from Boston, MA; New York City, NY; Chicago, IL; Anchorage, AK; and an industrial first responder representative from Eastman Kodak Company, Rochester, NY. Anchorage was utilized as the model for investigation of decontamination materials and protocols for cold weather. A study was instituted to attempt to determine the physiological effects of cold weather and water on victims.



**3. Conclusions.** The Mass Casualty Decontamination Research Team reviewed operational decontamination procedures and found that practical solutions to decontamination in cold weather involve the use of heated water, various forms of shelter, and dry decon solutions.

The Mass Casualty Decontamination Research Team made several observations:

- Even in cold weather, decontamination must be initiated quickly to prevent toxic effects and facilitate patient transport to medical facilities. Decontamination by removing clothes is still the most expedient and practical method for mass casualty decontamination in “cold weather.”
- Cold is a relative term. When the hydrant water is less than the ambient temperature, long exposure (two to three minutes) will bring on significant discomfort and shivering. The ambient temperature does not need to be freezing, cold weather can be as high as 60 degrees Fahrenheit. When victims are in minimal clothing and wet, they feel the cold more. Wind will add significantly to the discomfort of victims already wet.
- Victims that are showered, whether it is with warm or cold water, need to be provided with towels and blankets for warmth. It is imperative to move victims to an indoor space out of the wind and preferably heated.



- Victim decontamination without water is the most desirable. Blotting with paper towels or other absorptive materials at hand can significantly reduce the exposure to chemical agent.

A literature review was initiated to better understand the impact of cold water induced hypothermia. Long exposure to cold water along with a less than optimal outdoor environment can place cold weather decontaminated victims at great risk. Hypothermia can quickly occur at temperatures above 60°F. Victims experiencing hypothermia can have cognitive problems as well as medical problems. These reviews will be used to develop recommended decontamination practices for first responders to consider as air temperature, wind chill, and water temperature decrease. Results of this study will be posted to the SBCCOM Web site: <http://www2.sbccom.army.mil/hld> when they are completed.



## E. Water-Based Chemical Decontamination Study

**1. Study Objectives.** The purpose of this study is to outline the effectiveness of water-based decontamination on chemical warfare agents based on water volume and time in the decontamination shower. In order to provide a practical approach to evaluating the effectiveness of these guidelines by responders, the program is also developing a chemical agent simulant that mimics the characteristics of persistent chemical agents when undergoing decontamination. The intent of the study is to provide responders recommendations for determining how best to perform water-shower decontamination utilizing their existing equipment.



**2. Study Overview.** The CWIRP is conducting studies to determine the effectiveness of chemical agent skin decontamination using water flushing as the decontamination process. Water is the one resource that firefighters have and it is recommended as the primary means of performing mass casualty decontamination. Studies are conducted using one-inch squares of pigskin are contaminated with mustard, GB or VX. After designated time intervals these skin samples are exposed to different volumes of water for 1, 2, 5 or 10 minutes of showering time. The residual water and skin are analyzed to determine the amount of agent removed from the skin and levels of concentration in the water. The study provides insight into how the variations in the water flow rate and duration in the shower influence the amount of agent removed.

The skin decontamination study is expected to result in general guidelines regarding how much time should be spent in the decontamination shower. However, apparatus varies across the fire service as do the settings used to regulate the water flow. It is not possible for the CWIRP to conduct a decontamination study involving the parameters for all variations of fire equipment that exist. Therefore, to provide a practical application that emergency responders can use to measure the effectiveness of their decontamination operations; the CWIRP is seeking to develop an agent training simulant.



This effort involves recommending a material with the physical characteristics of a chemical agent that can be applied to skin and monitored post decontamination to evaluate the completeness of the decontamination process. The intent is to develop a material that is inexpensive, easy to make, and non-hazardous to both the users and the environment. This simulant, when used with published mass casualty guidelines, will give responders the necessary tools to evaluate their own procedures and equipment for effective chemical agent decontamination.

**3. Conclusions.** Through application of these guidelines and use of the simulant, responders will be able to verify if their current operational procedures provide sufficient decontamination. The results of this study will be posted to the SBCCOM Web site: <http://www2.sbccom.army.mil/hld> when they are completed.

## F. Vapor and Liquid Challenge Assessments

**1. Study Objectives.** The purpose of this technical initiative is to assess potential vapor hazards that may be encountered at the response perimeter of a chemical terrorism incident, and to assess the extent of liquid contamination likely to be produced by a chemical agent release. These assessments will be used to quantitatively evaluate the chemical hazard risks faced while using personal protective equipment at such incidents.

**2. Study Overview.** The vapor and liquid challenges in the various response zones of a chemical agent release are needed to assess the hazards presented to first responders operating in these zones. This initiative addresses both of these challenges. This information will allow responders to select personal protective equipment and to develop operating procedures that can effectively manage chemical risks.



Chemical vapor hazards associated with the immediate area of a chemical agent release were previously assessed as part of the CWIRP initiative reported in “Guidelines for Incident Commander’s Use of Firefighter Protective Ensemble (FFPE) with Self-Contained Breathing Apparatus (SCBA) for Rescue Operations During a Terrorist Chemical Agent Incident”, (CWIRP Report, August 1999). This work considered agent releases in enclosed-spaces whereby nineteen out of twenty people would be exposed to a lethal concentration during a fifteen-minute exposure. These values provide safe-sided estimates for responders operating in the hot zone of an interior space. The current vapor hazard study will determine potential vapor hazards at the perimeter of a chemical terrorism incident. The results of which will provide responders assistance in developing risk-based guidance to select personal chemical protective equipment and develop operational procedures for responders operating in these areas.

Initially during a chemical terrorist incident, responders will establish an initial evacuation zone. Later, they will establish an outer perimeter, inside of which people, such as news crews, interested bystanders, and other civilians will not be allowed to enter. Local law enforcement personnel may be called upon to maintain this perimeter. While the intent is to establish a perimeter outside of any agent hazard zone, the threat of agent drift and shifting winds, together with a lack of continuous air monitoring equipment, warrant the use of PPE on the perimeter.

The vapor hazard assessment portion of this technical initiative will use a standard atmospheric transport and diffusion model, D2PC (Downwind Hazard Assessment 2 for the Personal Computer), to assess the vapor hazards created at the various perimeters of a chemical incident. Vapor hazards will be determined for a range of chemical agent releases and atmospheric conditions.

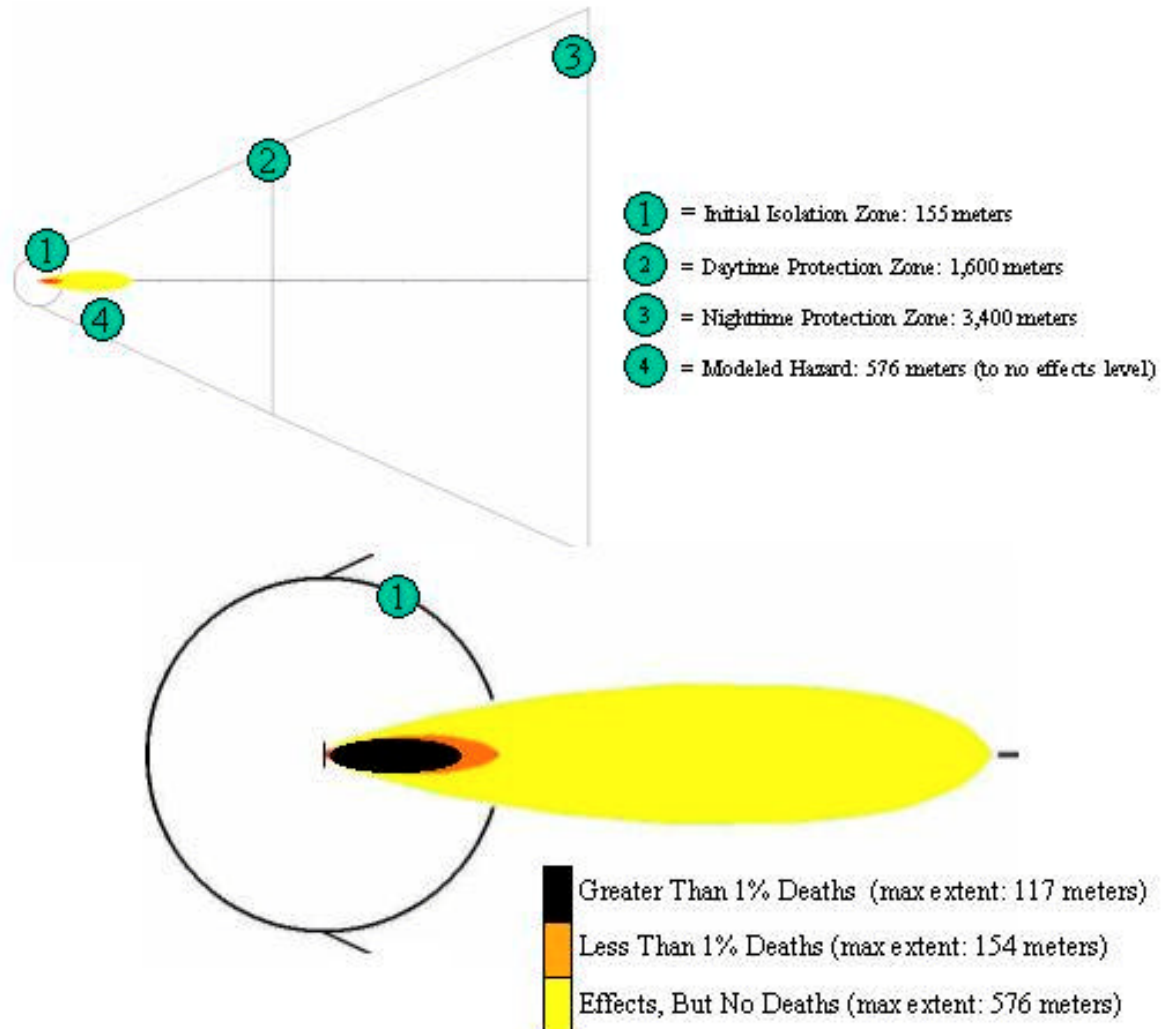
The process is illustrated in the following figure.



*Visual Comparison:*  
**2000 Emergency Response Guidebook**  
 vs.  
**Model Predictions of D2PCw (EMIS ver. 3.1)**  


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**5 gallon GB spill, Stability 'C', Wind Speed 5mps**



The upper part of this figure shows the initial isolation zone, the daytime protection zone, and the nighttime protection zone specified in the North American Emergency Response Guidebook associated with a release of a chemical agent. The lower part of the picture shows the various hazard zones associated with an example agent release as determined using the D2PC Model. D2PC is applied in the Chemical Stockpile Emergency Preparedness Program (CSEPP), to determine downwind hazards from chemical releases. Using the chemical challenge information produced by D2PC, we will determine the likely dosages at the various incident perimeters, and determine the concentrations that responders might experience in each of these areas. The simulations will indicate the time of arrival, time of exit, and the concentration of the vapor challenge. This information will allow us to determine the vapor challenges that will be received by various responders as they conduct their response activities at these perimeter locations.

These vapor challenge levels will be combined with the recommended protective ensembles from the program MIST tests to determine if the ensemble will effectively reduce the probability of chemical symptoms, or if greater protection is required. This information will allow responders to effectively match protective equipment to their mission and location thus ensuring that chemical terrorism response operations can be conducted safely.

This initiative also assesses the potential distribution of liquid contamination from devices that may be employed by terrorists. These measurements will indicate the area that may be contaminated with liquid agent and provide first responders with a visual indication of how various levels of agent contamination will appear. This information will help first responders determine the number of victims who might be contaminated with liquid by the initial dispersion, based on their proximity to the release, and the estimated size of the region where quantities of liquid chemical agents can be anticipated.

The CWIRP has performed studies and given guidance on performing limited reconnaissance and quick rescue in chemical vapor contamination. This guidance also states that responders should avoid contact with liquid contamination. Although this guidance should not change, it is clear that some amounts of liquid contamination may go unnoticed and may be contacted by responders. This study will provide first responders with estimates and measurements of how wide spread liquid agent contamination may be, as dispersed by simple terrorist devices.

Two phases of work are planned for this liquid dissemination study. In the first phase, water is being used to simulate an unthickened chemical agent. A florescent dye is added to the water so that liquid deposition can be quantitatively measured using ultraviolet light and digital photography. Agent is being disseminated by using a Preval<sup>®</sup> sprayer, as an example of a spray device, and by using a fragile, glass container, a spherical, decorative light bulb, dropped onto the floor.



The liquid deposition density is determined by photographing the dissemination pattern using ultraviolet illumination. A contour corresponding to ten grams per square meter will be

displayed that illustrates the extent of contamination against which military protective ensembles should provide adequate chemical protection.

These liquid dispersion test measurements compliment ongoing liquid hazard assessment tests involving chemical protective equipment favored by tactical, law enforcement teams.

Large amounts of liquid, up to 55 gallons, cannot be disseminated in simple trials. To determine liquid distributions for larger amounts of liquid dissemination, models will be used. These modeling results will provide liquid hazard regions for larger liquid dissemination processes.

**3. Conclusions.** By assessing the distribution of liquid contamination and the vapor challenge levels anticipated in the different response zones of a chemical agent incident, we can evaluate hazards faced by responders using various personal protective equipment ensembles. With this information, responders will be able to identify appropriate protective ensembles for various response activities and they will be able to develop operating procedures that will allow responders to accomplish their missions, while keeping risk levels manageable. Results of these studies will be incorporated into the Programs' personal protective reports associated with emergency response to chemical terrorism.

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## Part V

### List of Acronyms

## **Domestic** *Preparedness*

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ACF	Alternative Care Facility
BALTEX	Baltimore Exercise
BLS	Basic Life Saving
BW IRP	Biological Weapons Improved Response Program
C/B	Chemical and Biological
CSEPP	Chemical Stockpile Emergency Preparedness Program
CWA	Chemical Warfare Agent
CW IRP	Chemical Weapons Improved Response Program
D2PC	Downwind Hazard Prediction Model for Personal Computer
DMORT	Disaster Mortuary Team
DoD	Department of Defense
DOJ	Department of Justice
DPP	Domestic Preparedness Program
EMS	Emergency Medical Services
EOD	Explosive Ordnance Disposal
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FFPE	Firefighter Protective Ensemble
FSL	Federal, state, and local
Hazmat	Hazardous Materials
HD	Distilled Mustard agent
IRP	Improved Response Program
MeS	Methyl Salicylate
MFM	Mass Fatality Management
MIST	Man-In-Simulant Tests
MSP	Maryland State Police
NPV	Negative Pressure Ventilation
OST <sup>3</sup> C	Off-Site Triage, Treatment, and Transportation Center

PBI	Polybenzimidazole
PF	Protection Factor
PIO	Public Information Officer (Office)
PPE	Personal Protective Equipment
PPV	Positive Pressure Ventilation
PSP	Pennsylvania State Police
QRG	Quick Response Guide
SCBA	Self-Contained Breathing Apparatus
SERT	Special Emergency Response Team
STATE	Special Tactical Assault Team Element
SWAT	Special Weapons and Tactics
TOPOFF	Top Officials Exercise
WMD	Weapons of Mass Destruction